Dell™ PowerVault™ LTO-2-024 Tape Drive User's Guide

Notes, Notices, and Cautions

Note: A note indicates important information that helps you make better use of your computer.

Notice: A notice indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

CAUTION: A CAUTION indicates a potential for property damage, personal injury, or death.

Introduction

Overview

Thie Dell™ PowerVault™ LTO-2-024 is a third generation LTO tape drive designed for high performance, high capacity, and high reliability data storage in a small form factor. Due to the low power consumption, low heat dissipation, and multiple mounting holes, the PowerVault LTO-2-024 can easily be integrated into desktop workstations and servers, as well as in a table-top version connected externally to the server. Using advanced technologies, this drive offers twice the capacity and data transfer rates of the preceding generation but needs only half the space.

The external table-top version has a rugged design that allows for an easy connection to the host system.

Figure 1: The PowerVault LTO-2-024 Tape Drive

Internal drive	External drive
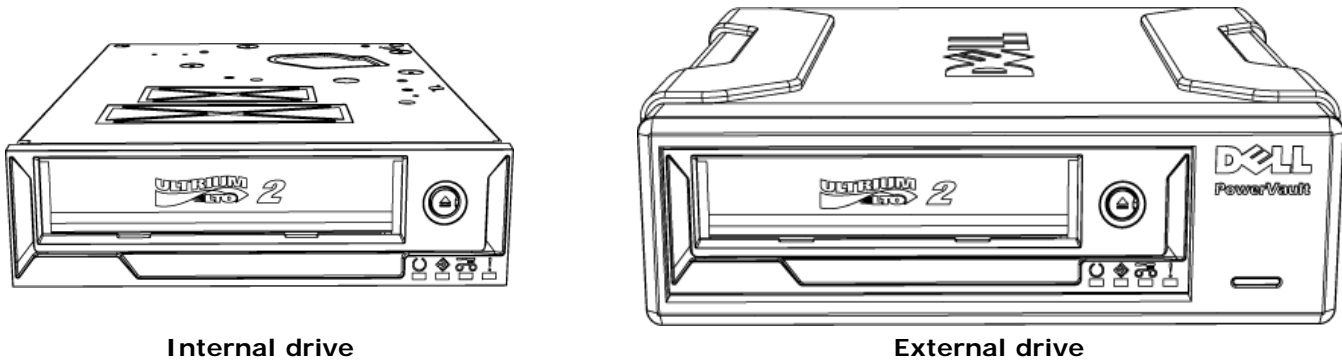
Features

The tape drive has the following features:

- Ultra160 SCSI interface
  Provides excellent performance.

- High speed back-up.
  Provides 24 MByte/sec native transfer rate

- Backward compatible for investment protection
  Read/write compatible with LTO2 and LTO1 media.

- Embedded quality monitoring and test features
  Provides preventive maintenance information for reduced down time.

- Small footprint
  5.25 inch half-height form factor with several mounting capabilities for easy and trouble free integration into servers and workstations.

- Rugged external table-top version.

- Media Management
  Keeps track of Read/Write performance and detects when the drive needs cleaning, if there is a defective or worn media, or the tape drive head has degraded.

- Stand Alone Diagnostics
  Provides self-diagnostic routines independent of the host to troubleshoot the drive.

- Intelligent Head Cleaning

Determines and initiates a head brush cleaning when needed as well as indicating the need for a cleaning cartridge when required.

- Intelligent Thermal Guard
  Provides drive and media protection by monitoring the internal temperature. The drive will slow down or even stop an operation if needed to avoid destruction of critical drive components or the media.

- Smart Gripper™
  Catches and holds the tape pin firmly avoiding "lost leader" problems

- Variable Speed
  Provides host transfer rate matching by dynamically selecting between five different transfer rates (12 - 24 MB/sec).

Capacity and Transfer Rates

Characteristic	Value
Tape length (m)	609
Native capacity (GB)	200
Compressed capacity (GB) assuming 2:1 compression	400
Native transfer rate (MB/sec)	24
Variable speed transfer rates (MB/sec)	12, 15, 18, 21, 24

SCSI Bus Interface

The PowerVault LTO-2-024 tape drive is designed to operate with a burst transfer rate up to 160 MB/sec, and may be attached to an Ultra160 or Ultra 320 low voltage differential (LVD) SCSI bus.

The tape drive features a high density 68-pin (HD-68) connector for attachment to the server or to the interface connector in an external tabletop device.

Note: Dell recommends that you attach the tape drive to SCSI controllers that support the SCSI LVD interface only. Attaching the tape drive to a non-LVD SCSI controller or an 8-bit narrow SCSI controller will degrade the performance of your tape drive and backup operations. Performance will also be degraded if you attach non-LVD SCSI devices on the same bus cable as your LVD connection. If you install an adapter, it is recommended that you purchase a SCSI LVD controller kit that includes the SCSI cable and terminator.

Do not connect the tape drive to a disk RAID controller (disk RAID controllers are not supported). If, however, your system is a Dell server with an embedded RAID solution that can be configured for RAID/SCSI operation, the tape drive can be connected to the SCSI channel.

Tape Backup Software

You will need tape backup software that supports the Dell PowerVault™ tape drive. Note that native backup applications (for example, the UNIX® .tar command) generally do not provide the required data streaming rate to get the full performance out of your tape drive. (However, if for some reason you need to use the Microsoft® Windows® native backup software, the drivers for your tape drive under Windows 2003 are included on the CD that came with the drive.) Dell recommends using a backup application that provides improved memory management as well as other useful features, such as TapeAlert.

See the User's Operating Guide supplied with your Tape Backup application. For the latest supported software versions, go to the Dell Support website at **www.support.dell.com** or visit the support site of your backup software vendor.

Data Compression

Data Compression is a way to increase capacity on a storage device. Compression ratios are normally specified to be 2:1, assuming that it is possible to store twice as much data on the tape as without data compression. However, the compression rate is dependant on the type of data (i.e. ordinary text files can be compressed in a much higher rate than program, media, and picture files).

There are two ways to compress data, hardware compression and software compression. Hardware compression means that the data compression is done by the electronics in the storage device. Software compression means that an

application program in the host computer is compressing the data before it is sent to the storage device. Hardware compression is much more efficient and works much faster than software compression.

The PowerVault LTO-2-024 tape drive uses SLDC hardware compression to compress data. This feature is enabled per default but the user may turn off data compression through the application software.

Note: If the data is compressed by software in the host computer, and then sent to a device that does hardware compression, the data have a tendency to expand instead of being compressed because the control data used on the tape.

Be sure to turn the software data compression off if using the PowerVault LTO-2-024 - which has embedded hardware compression.

Front Panel LEDs

Figure 2: Status indicators (LEDs) on the front panel
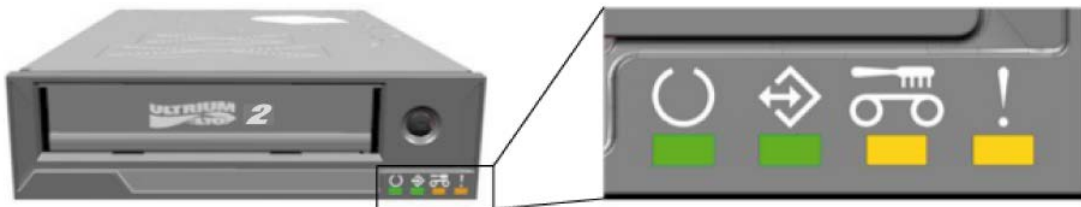

Table 1: Front-Panel LEDs

READY LED (Green)	Activity LED (Green)	CLEAN LED (Amber)	FAULT LED (Amber)

For complete information including failure conditions and FW loading see Front LED Indicators.

Troubleshooting

In case of problems with the operation of your PowerVault LTO-2-024 tape drive and before contacting the Customer Services Group, ensure that you check the following:

Hardware Troubleshooting

1. Check that the system recognizes the tape drive during the boot process.

2. Check that the SCSI host adapter recognizes the tape drive during its initialization.

3. Check the tape drive front panel LED status.

4. Check that the SCSI ID of the drive is not conflicting on the SCSI bus.

5. Check that the power cable is inserted correctly.

6. Check that the SCSI cable connections including termination are made correctly.

Software Troubleshooting

1. Check that the operating system does not report a problem during the boot.

2. Check that the driver for the SCSI host adapter is present and loaded properly.

3. Check that the correct tape device driver has been installed properly - if applicable.

4. Check that the backup software does not report any error messages when loading.

5. If any problem occurs, reinstall the backup application software and check that the PowerVault LTO-2-024 is recognized.

Verifying Recent Changes

If the PowerVault LTO-2-024 has been installed previously and operating correctly but is now incurring a problem, verify any recent changes to the system to ensure that these changes are not causing the problem. Try the following:

1. If the system configuration has changed:
   Remove the change to see if it affected the tape drive.

2. If an operating system corrective patch has been installed:
   Remove it to see if it affected the tape drive.

3. If a SCSI device has been added:
   Check for SCSI ID conflicts.

4. If a SCSI device has been added:
   Check the SCSI termination.

Standalone Diagnostics

The main objective of Standalone Diagnostics test is to test the complete drive as comprehensively and quickly as possible without any drive configuration or host support. The tool can also be used to verify tapes.

Starting the Test

A Standalone Diagnostic test requires a tape that is not write-protected. The media type can be any media type that supports a tape format that can be written by the drive.

Notice: Since the test involves write operations, the existing tape contents will be destroyed.

Note: If the Clean LED is On, it will remain On after a test is run. To clear the Clean LED, run a cleaning cartridge.

1. Ensure that no cartridge is loaded. If a cartridge is loaded it can be ejected by double-clicking the eject button.

2. Enter Service Mode by keeping the **Eject** button pressed for at least 6 seconds.
   The Ready LED (on the left) starts flashing quickly (indicating the drive is in Service Mode and that Service entry number 1 is active).

3. Insert the tape cartridge into the drive within 15 seconds.

   The drive loads the cartridge and the Ready LED starts flashing indicating that Standalone Diagnostics has started. The eject button has now returned to normal mode. During the Standalone Diagnostics test, it is possible to abort the test and eject the cartridge by clicking the eject button. The drive indicates the detection of the abort request by flashing both the Ready and Activity LEDs. Depending on which stage the test is aborted, it may take a while before the drive starts the eject operation. When the cartridge has been ejected, all LEDs are turned off. The Clean LED may still be On.

   The Ready LED will continuously flash during the entire testing process. The Activity LED will flash as the tape is in motion during testing.

   If no cartridge has been inserted after 15 seconds, the LEDs revert back to their initial state and the eject button must be pressed for 6 seconds again to get back to Service Mode.

Test Sequence

The Standalone Diagnostics test will perform the following operations:

Collect Information: Reads and stores drive and media information:

- Firmware and drive ID
- Tape type and format
- Cartridge serial number
- Error History Log and Log page 0x33 from EEPROM
- Run-time counters from EEPROM

Mainboard Test. Tests the mainboard hardware.

Cartridge Manipulation Test: The Cartridge Manipulation Test performs the same mechanical movement operations as those performed during Cartridge Load and Eject.

Read/Write Test: This test involves actual reading and writing on the tape medium. A write pass and a read pass are executed.

When the test has completed without errors the tape cartridge is ejected. No LEDs will be lit. The Clean LED may be On.

Failure Indication

When a failure has been detected the tape is not ejected and the Failure LED will be flashing.

Note for programmers:
Detailed test results are available through the **Receive Diagnostics** SCSI command. To use this command, Support-only tools are required.

If a write protected, unsupported, or damaged tape cartridge is inserted prior to starting the Standalone Diagnostics test, it will be ejected by the drive and the Failure and **Activity** LEDs will be flashing while the **Ready** LED is off. The two flashing LEDs can be turned off by clicking the eject button.

Media Management Reporting

Media Management (MM) is a feature embedded in the PowerVault LTO-2-024 tape drive's firmware that monitors the read and write performance of the tape drive and media. Write performance information is written on the media header every time the media is rewound, and before the media is unloaded.

Cleaning is Required

If the write performance falls below a set re-write threshold, the PowerVault LTO-2-024 reports that cleaning is required by setting the Clean LED to a steady amber. If you are using a backup application that supports TapeAlert then the application will also report that the drive requires cleaning. See Cleaning Procedure for instructions on how to clean.

Degraded Media

If the write performance is still below the re-write threshold after cleaning, MM illuminates the Clean LED (set to steady amber) and reports to the backup application software that the media is degraded.

The degraded media warning means that the cartridge should not be used; it may become worn to the point where drive cannot write or read successfully using this cartridge.

Problem Situations

Dead on Arrival

1. Check LED activity at power up.
   All four LEDs should flash for two seconds at power up and the Ready LED flashes for several seconds while the power-on self test is running.

2. Make sure that the power supply used is working:
   Measure with an external voltmeter or use a verified supply.

3. Perform "**drive dead test**" when supply is verified.
   Push the eject button for at least 6 seconds to enter the "drive dead test". The Activity LED should keep flashing for approximately 15 seconds.

If the drive still looks dead try to remove all cables except power and rerun the "drive dead test." A defective cable or SCSI host bus adapter may affect the drive.

Drive Not Detected by the Operating System

1. Check LED activity at Power Up.
   All four LEDs should flash for two seconds at power up and the **Ready** LED flashes for several seconds while the power-on self test is running.

2. Check the SCSI ID.
   Each device on the SCSI bus needs a unique SCSI ID. The SCSI ID is set with jumpers on the back of the drive. See SCSI Configuration.

3. Check SCSI termination.
   The SCSI bus should be terminated at the end of the cable. A defective terminator may affect the drive.

Will Not Insert/Hold Media or Media is Not Recognized

1. Check the cartridge type.
   The PowerVault LTO-2-024 will only accept LTO-3, LTO-2 or LTO-1 type data or cleaning cartridges.
   If a wrong type of cartridge is inserted, the drive will eject the media with the Activity LED and Fault LED flashing.

2. Check media orientation.
   The arrow on the cartridge must point into the tape drive facing up when the tape drive is mounted horizontally with the LEDs on the right.
   Media can be inserted only one way and there are mechanical blocks to prevent improper insertion.

3. Try using a new cartridge.
   If it loads correctly, check the failing cartridge for damage.

4. Check failing media for pin damage (buckling pin).
   Hold the cartridge in your hand with the write protect switch to your left and orientation arrow pointing from you. On the right side, all the way towards the front is a small door that can be opened by sliding the door towards you. Inside the cartridge you should see a metal pin that is held tightly in place and has media attached to it. If the pin is missing, loose or damaged the tape will be rejected from the drive.

Noisy Tape Drive

There are no fans in the PowerVault LTO-2-024 tape drive and any noise should be very low in idle mode. When the tape is in motion, noise can come from the media and motors when loading or reading/writing data. The sound should be steady when streaming but may be intermittent if the host is not delivering data at the data rate of the drive.

1. Check if the noise comes from the cartridge.
   Insert new media – first check this media for any damage.

2. Check that the PowerVault LTO-2-024 is mounted correctly.
   If the PowerVault LTO-2-024 is mounted incorrectly, it can produce abnormal noise when the tape moves.

Cartridge is Stuck Inside the Drive

1. Try to eject the cartridge by pushing the **Eject** button

2. Do a drive reset using the Service mode.
   Service mode is entered by keeping the eject button pressed for at least six seconds. The Activity LED starts flashing.

   To reset the drive, push the eject button once more to make the Activity LED flash. While the Activity LED is flashing, double-click the eject button. This should invoke a reset of the drive.

   If the button is not pushed for 15 seconds, the eject button reverts back to its original cartridge eject function.

3. Power cycle the drive (switch power on/off, if possible).

Fault LED Flashes Amber and the Activity LED is Off

The tape drive reports that it has a failure.

1. Do a Drive reset using the Service mode.
   Service mode is entered by keeping the **Eject** button pressed for at least six seconds. The Ready LED will start flashing.

   To reset the drive, push the eject button once more to make the Activity LED flash. While this LED is flashing, double-click the eject button. This should make the drive do a reset.

   If the button is not pushed for 15 seconds, the eject button reverts back to its original cartridge eject function.

2. Power cycle the drive (switch power on/off, if possible).

Fault LED Flashes Amber and the Activity LED is Flashing

The drive signals Media Error.

To eject media, press the Eject button.

1. Ensure the media is the correct type and compatible.

2. Check the write protection switch position.

3. Check if the media is damaged (see Will Not Insert/Hold Media or Media is Not Recognized).

4. Check if an expired cleaning cartridge was used (Clean LED is On).

Clean LED is On

The Clean LED will be lit 100 hours after the last cleaning operation or after an unrecoverable read or write error. These errors are often caused by debris on the head indicating the drive should be cleaned. See Cleaning Procedure for cleaning instruction.

Incorrect Data Compression

1. Check if data is already compressed
   Data may have been compressed by software in the host computer.

In some cases data will actually expand when subjected to both the hardware and software compression. This can occur when sending data already compressed at the software application level to the drive and the compression option is enabled. If this is the case the drive may try to turn compression on and off to optimize the data storage having the negative unintended result of data expansion.

Note: The PowerVault LTO-2-024 has compression On by default. The compression can be turned Off by using the SCSI Mode Select command.

2. Turn Off any software compression in use.
   The compression is already being accomplished at the hardware level of the PowerVault LTO-2-024 drive. Therefore any other compression software in the host or on the host bus adapter should be turned off.

   The data is compressed using the SLDC (Streaming Lossless Data Compression) algorithm that is based on ALDC (Adaptive Lossless Data Compression). The SLDC format is defined in the ECMA-321 standard. Two enhancements are introduced:

   o Two methods to reduce expansion of uncompressible data.

   o Embedded code word.

Slow Performance

- Check that the software driver used for the PowerVault LTO-2-024 is the latest version.
- Check the SCSI ID
  Each device on the SCSI bus needs a unique SCSI ID. The SCSI ID is set with jumpers on the back of the drive.
- Check SCSI termination
  The SCSI bus should be terminated at the end of the cable. A defective terminator may affect the drive.
- Clean the tape drive.
- Perform a Drive Diagnostics test.

Intermittent Failures

If the drive fails intermittently:

1. Clean the tape drive.

2. Check the SCSI termination on the SCSI bus.

3. Check the operating system logs for any errors.

If the problem occurs in the middle of an operation:

1. Use a different data cartridge.

2. If the error occurs when the software scans for the files to be backed up, please operate a SCANDISK (or similar) operation to check the state of the File Systems(s) and hard disk.

If the error consistently occurs on the same file or directory:

1. Try to remove the file or directory from the backup operation to see if that corrects the problem.

2. Use a different data cartridge before the drive is sent for service.

3. If the issue is still not resolved, contact technical support.

Installation - Internal drive

⚠️ **CAUTION: Before performing any of the procedures in this section, read and follow the safety instructions located in your tape drive's *Product Information Guide*.**

Pre-Installed Drives

Dell™ installs and configures drives that are shipped as part of the system. However, the tape backup software is not installed by Dell. Installation instructions are provided with the software.

Store the tape backup software CD/diskette that ships with your system in a safe place in case you ever need to reinstall the software.

Installing the Drive

If your tape drive is not pre-installed, the installation instructions are in the following sections.

Installing the Drive: Prerequisites

You need the following items to install your internal tape drive:

- Ensure that the SCSI host bus adapter is one of the supported types. For a list of the supported SCSI adapters, go to the Dell Support website at **www.support.dell.com.**
- 5.25-inch half-height bay.
- Internal SCSI-cable with an LVD terminator attached.
- Backup application software that supports the internal tape drive.
- Phillips screwdriver, if your system uses Phillips screws.
- Flat-bladed screwdriver, if your system uses flathead screws.
- TORX screwdriver, if your system uses TORX screws.
- System documentation, which you can refer to during the installation.

Mounting Bay and Hardware

You need one industry standard, 5 1/4-inch, half-height bay to install the PowerVault LTO-2-024 drive.

⚠️ **CAUTION: The computer must provide forced cooling and be capable of drawing 6 cfm (0.17 cubic meters/minute or 10.08 cubic meters/hour) of air through the tape drive.**

See your system documentation to ensure that your system meets these requirements. Also, the documentation specifies if any special mounting brackets are needed. Next, ensure that all fans in your system are in place and operational and that empty bays have the appropriate blanking plates so that airflow is maintained.

Installing the Drive: SCSI Configuration and Connection

The PowerVault LTO-2-024 tape drive is designed to operate on an Ultra160 or Ultra320 low voltage differential (LVD) SCSI bus with an LVD SCSI terminator.

SCSI Configuration

All devices on a SCSI bus need their own unique identification, called the SCSI ID. If a SCSI ID conflict exists, some of the SCSI devices will not be recognized by your system. Normally the SCSI Host Adaptor (HBA) uses SCSI ID 7 and the

default for the drive is SCSI ID 6. The SCSI ID is set with Jumpers as shown below.

Figure 1: Drive connectors, internal model
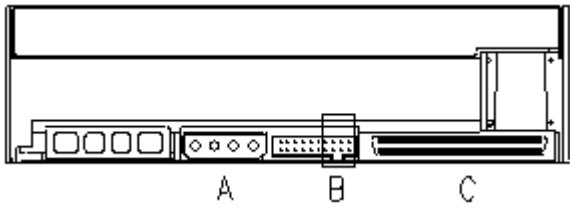
A = Power Connector
B = Service Connector (the right-most 4 strap pin pairs of the complete connector)
C = SCSI connector

Table 1: Service Connector strap settings for SCSI ID (Dark = Strap mounted)

Example: SCSI ID = 6

SCSI ID=0
SCSI ID=1
SCSI ID=2
SCSI ID=3
SCSI ID=4
SCSI ID=5
SCSI ID=6 (Default)
SCSI ID=7
SCSI ID=8
SCSI ID=9
SCSI ID=10
SCSI ID=11
SCSI ID=12
SCSI ID=13
SCSI ID=14
SCSI ID=15
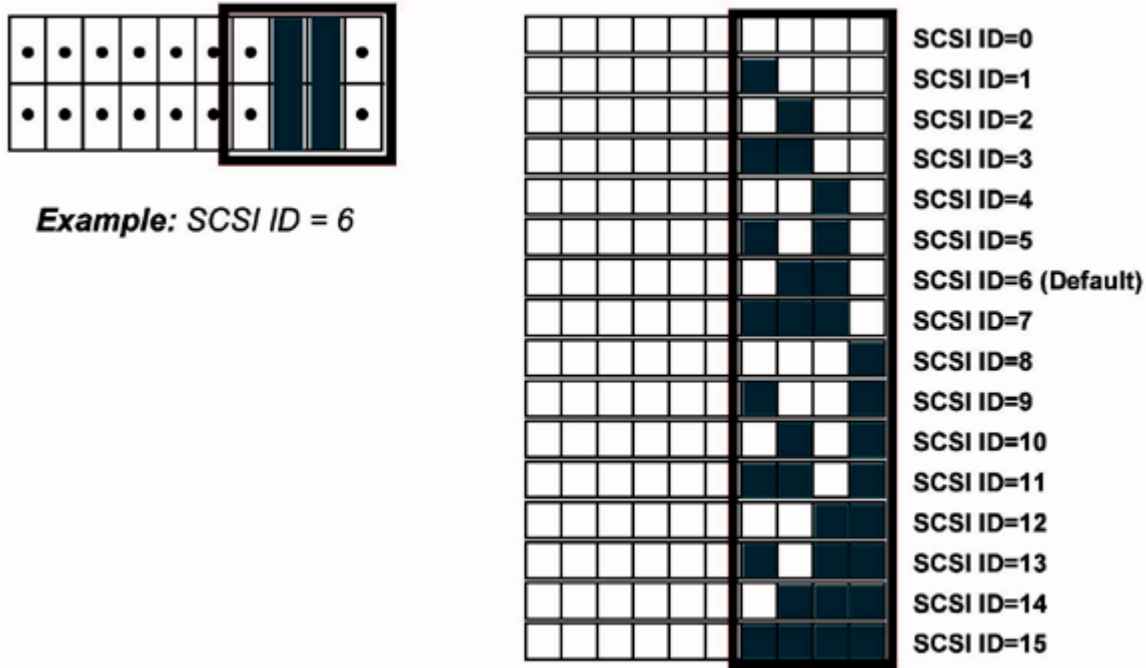
If the tape drive is going to share the SCSI bus with other devices, check the SCSI ID numbers used by the other devices, then set the drive's SCSI ID to a number that is not being used.

Note: Notice that the SCSI host adapter uses ID 7.

For optimal performance Dell recommends that the tape drive be the only device on the SCSI bus.

SCSI Termination

A SCSI bus must be terminated at both ends. The SCSI Host Adaptor provides the termination for one end but the tape drive does not provide termination for the other. Therefore, if the tape drive is the last device on the bus, a cable with proper LVD termination is required within 10 cm of the drive as illustrated below.

Figure 2: SCSI cable
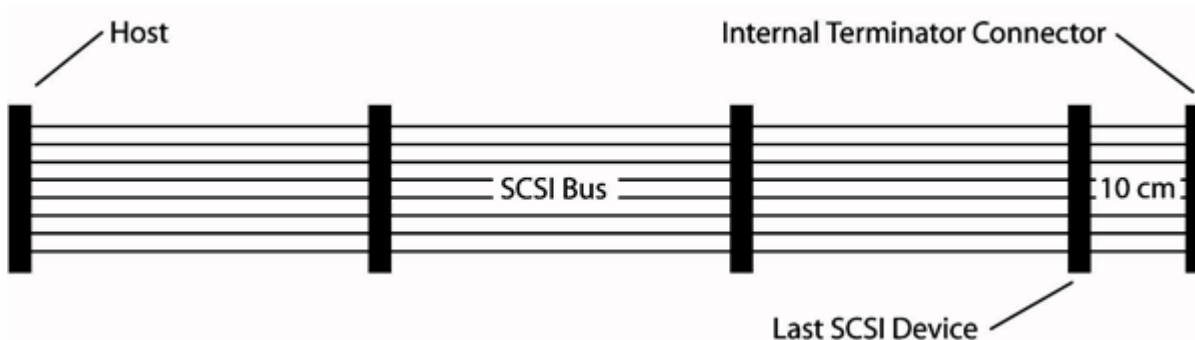
PowerVault LTO-2-024 has a combined SCSI-LVD/SE interface embedded. The PC-98 Specification specifies that the termination of the SCSI bus system is a part of the SCSI-cable and not a part of the SCSI-device.

For internal devices, a SCSI-cable with an integrated terminator or a separate terminator applied to the end connector of the cable, 10 cm from the last device must be used.

Installing the Drive: Mechanical Installation

Mechanical mounting specifications are specified in the illustration below.

Figure 3: Allowed mounting orientations
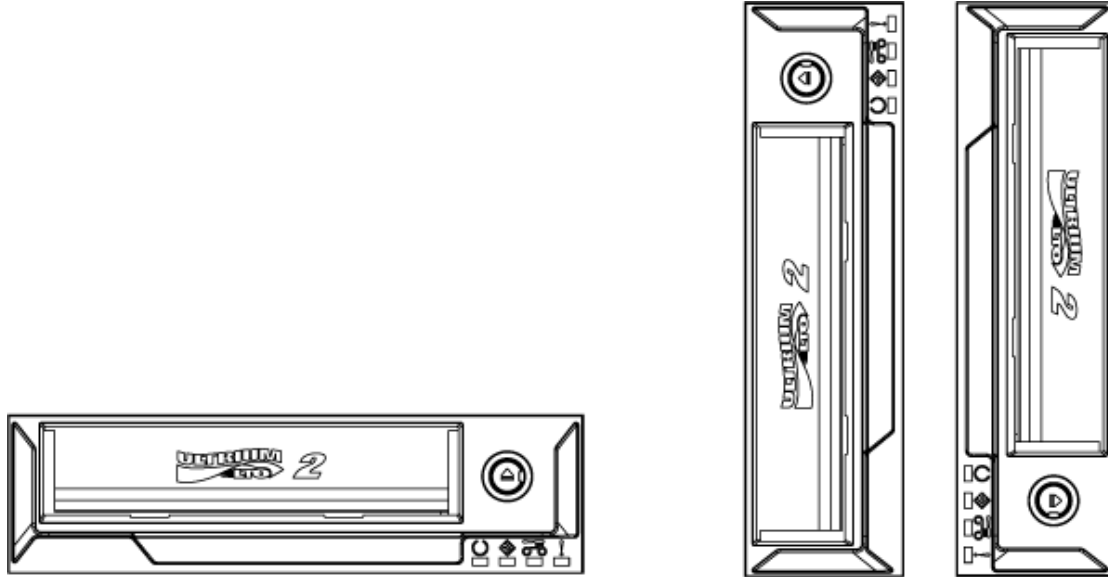
Mounting Screw Requirements

The tape drive occupies a half-height 5.25" slot within your system.

Depending on the server design, the tape drive may be supplied with shoulder screws or flat screws, provided in a separate bag.

Figure 4: Mounting specifications, shoulder screws
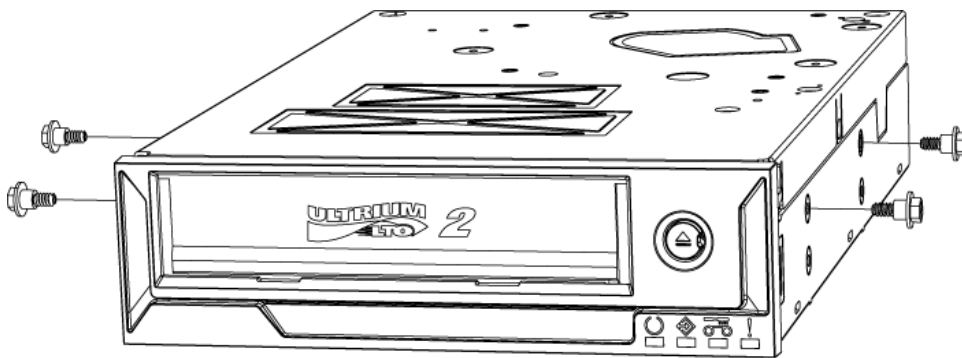
The shoulder screws shall be mounted in the four upper mounting holes of the drive. Fix the screws firmly without using excess force. Slide the drive with the shoulder screws attached into the mounting slot of the server.

If the server is designed for flat screws, it shall be mounted in a carrier sled using mounting brackets:

1. Place drive in carrier and align screw mounting holes in the drive near front of screw hole slots in the carrier (For best fit, the drive screw holes should be as close to the front of the carrier screw slots as possible.)
2. Using the M3x3mm screws, attach drive to carrier sled through the exposed mounting holes.

Tape Drive Installation

⚠ **CAUTION: To avoid personal injury or damage to the computer or tape drive, ensure that the system is**

disconnected from the main power source while you install the drive.

Figure 5: Installing the internal tape drive
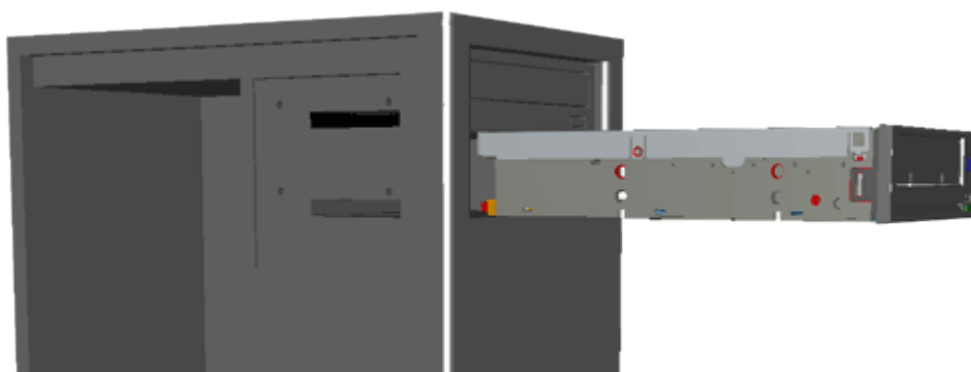
1. Gather the necessary tools and materials.

2. Shut down the system and turn off any connected peripherals.

3. Remove the side cover, front panel (if necessary), and filler panel from a 5.25-inch bay of your system as detailed in the system's documentation.

4. Orient the drive as shown in figure 6.

5. Secure the tape drive to the bay.
   NOTE:
   If shoulder screws are already attached to the drive then slide the drive in the system until it is secure.
   If screws are provided in a separate bag install shoulder screws as shown in figure 4.
   If the screws provided are flat screws, install the mounting rails as given by the server documentation.

6. Connect the power and SCSI cable, as shown in figure 6. Be careful to connect the cables in the right orientation. Before powering on the server, check the SCSI settings as detailed in the next section.

Figure 6: Connecting the cables to the tape drive

Installing Tape Backup Software

Install your backup program as specified in the software's documentation.

Installing Software Device Drivers

Note: Most backup applications provide all the necessary device driver support for your drive. However, if you intend to use the drive with the Microsoft® Windows® native backup software you will need the drivers included with the *Dell PowerVault LTO-2-024 Tape Drive Documentation and Drivers CD*. The latest drivers can be downloaded from **www.support.dell.com.**

Windows Server 2003

Windows Tape Driver Installation

1. Right-click **My Computer**.

2. Select **Manage**, you should see the tape drive under "Other devices" with a "?".

3. Select the device, right click and select **Properties**.

4. Select the appropriate driver location.

5. Follow the instructions on the screen.

Backup Utility for Windows

The Backup application is included in the Windows Operating System.

Before running the application, make sure the tape driver for your PowerVault LTO-2-024 tape drive is properly installed.

To start the application, click **Start** ➜ **Programs** ➜ **Accessories** ➜ **System Tools** ➜ **Backup.**

Linux

SCSI Host Adapter

Linux contains a driver for most SCSI host adapters. For more information, see the documentation provided with the SCSI host adapter.

If the driver cannot be found, see the documentation provided with the SCSI host adapter.

Linux System Command

TAR, **CPIO** and **DD** allow simple backup, verify or restore operations to be performed.

Two different device drivers can be used:

- A *Non Rewind* device driver (used to perform append backup)
- A *Rewind* device driver (used only to perform overwrite backup)

Tar command examples:

tar cvf /dev/st0 /etc performs the backup of the */etc* directory

tar tvf /dev/st0 reads the data on the tape

tar xvf /dev/st0 restores the data from the tape to the current directory tree

Note: For a complete explanation on how to use the system commands, please refer to the Linux documentation, or the online help. (MAN command).

Verifying Tape Drive Operation

Once you have installed the PowerVault LTO-2-024 tape drive, verify that it is functioning properly before you attempt to store data.

1. Switch on the host computer.

2. The PowerVault LTO-2-024 tape drive starts a power on self test (POST) that exercises most of its functionality.

3. All four LEDs light up for 2 seconds during power-up (see Front LED Indicators).

4. The Activity LED flashes during POST.

5. When complete only the Ready LED will remain on.
   If there is an error, the tape drive will flash the Fault LED. Please refer to Troubleshooting if this happens.

6. Firmly push the cartridge to its end stop, then release the cartridge.

- The Activity LED will start flashing.

- The cartridge will move back a short section.

- The cartridge will then be lowered into the drive.

- The tape will be loaded. The sound of the gears may be heard.

- When the tape is fully loaded, the Activity LED will stop blinking, and the Ready LED will remain on.

Getting Help

- [Technical Assistance](#)
- [Dell Enterprise Training and Certification](#)
- [Problems With Your Order](#)
- [Product Information](#)
- [Returning Items for Warranty Repair or Credit](#)
- [Before You Call](#)

Technical Assistance

If you need assistance with a technical problem, perform the following steps:

1. Complete the procedures in "Troubleshooting Your System."

2. Run the system diagnostics and record any information provided.

3. Make a copy of the [Diagnostics Checklist](#), and fill it out.

4. Use Dell's extensive suite of online services available at Dell Support at **www.support.dell.com** for help with installation and troubleshooting procedures.

   For more information, see "Online Services."

5. If the preceding steps have not resolved the problem, call Dell for technical assistance.

NOTE: Call technical support from a phone near or at the system so that technical support can assist you with any necessary procedures.

NOTE: Dell's Express Service Code system may not be available in all countries.

When prompted by Dell's automated telephone system, enter your Express Service Code to route the call directly to the proper support personnel. If you do not have an Express Service Code, open the **Dell Accessories** folder, double-click the **Express Service Code** icon, and follow the directions.

For instructions on using the technical support service, see "[Technical Support Service](#)" and "[Before You Call](#)."

NOTE: Some of the following services are not always available in all locations outside the continental U.S. Call your local Dell representative for information on availability.

Online Services

You can access Dell Support at **support.dell.com**. Select your region on the **WELCOME TO DELL SUPPORT** page, and fill in the requested details to access help tools and information.

You can contact Dell electronically using the following addresses:

- World Wide Web

  www.dell.com

  www.dell.com/ap (Asian/Pacific countries only)

  www.dell.com.cn (China only)

  www.dell.com/jp (Japan only)

  www.euro.dell.com (Europe only)

www.dell.com/la (Latin American countries)

www.dell.ca (Canada only)

- Anonymous file transfer protocol (FTP)

ftp.dell.com/

Log in as `user:anonymous`, and use your e-mail address as your password.

- Electronic Support Service

support@us.dell.com

apsupport@dell.com (Asian/Pacific countries only)

cn_support@dell.com (China only)

support.jp.dell.com (Japan only)

support.euro.dell.com(Europe only)

- Electronic Quote Service

sales@dell.com

apmarketing@dell.com (Asian/Pacific countries only)

sales_canada@dell.com (Canada only)

- Electronic Information Service

info@dell.com

AutoTech Service

Dell's automated technical support service—AutoTech—provides recorded answers to the questions most frequently asked by Dell customers about their portable and desktop computer systems.

When you call AutoTech, use your touch-tone telephone to select the subjects that correspond to your questions.

The AutoTech service is available 24 hours a day, 7 days a week. You can also access this service through the technical support service. See the contact information for your region.

Automated Order-Status Service

To check on the status of any Dell™ products that you have ordered, you can go to **www.support.dell.com**, or you can call the automated order-status service. A recording prompts you for the information needed to locate and report on your order. See the contact information for your region.

Technical Support Service

Dell's technical support service is available 24 hours a day, 7 days a week, to answer your questions about Dell hardware. Our technical support staff use computer-based diagnostics to provide fast, accurate answers.

To contact Dell's technical support service, see "Before You Call" and then see the contact information for your region.

Dell Enterprise Training and Certification

Dell Enterprise Training and Certification is available; see **www.dell.com/training** for more information. This service may not be offered in all locations.

Problems With Your Order

If you have a problem with your order, such as missing parts, wrong parts, or incorrect billing, contact Dell for customer assistance. Have your invoice or packing slip available when you call. See the contact information for your region.

Product Information

If you need information about additional products available from Dell, or if you would like to place an order, visit the Dell website at **www.dell.com**. For the telephone number to call to speak to a sales specialist, see the contact information for your region.

Returning Items for Warranty Repair or Credit

Prepare all items being returned, whether for repair or credit, as follows:

1. Call Dell to obtain a Return Material Authorization Number, and write it clearly and prominently on the outside of the box.

   For the telephone number to call, see the contact information for your region.

2. Include a copy of the invoice and a letter describing the reason for the return.

3. Include a copy of any diagnostic information (including the Diagnostics Checklist) indicating the tests you have run and any error messages reported by the system diagnostics.

4. Include any accessories that belong with the item(s) being returned (such as power cables, media such as CDs and diskettes, and guides) if the return is for credit.

5. Pack the equipment to be returned in the original (or equivalent) packing materials.

   You are responsible for paying shipping expenses. You are also responsible for insuring any product returned, and you assume the risk of loss during shipment to Dell. Collect-on-delivery (C.O.D.) packages are not accepted.

Returns that are missing any of the preceding requirements will be refused at our receiving dock and returned to you.

Before You Call

NOTE: Have your Express Service Code ready when you call. The code helps Dell's automated-support telephone system direct your call more efficiently.

Remember to fill out the <u>Diagnostics Checklist</u>. If possible, turn on your system before you call Dell for technical assistance and call from a telephone at or near the computer. You may be asked to type some commands at the keyboard, relay detailed information during operations, or try other troubleshooting steps possible only at the computer system itself. Ensure that the system documentation is available.

⚠ **CAUTION: Before servicing any components inside your computer, see your *System Information Guide* for important safety information.**

Diagnostics Checklist
Name:
Date:
Address:
Phone number:
Service Tag (bar code on the back of the computer):
Express Service Code:
Return Material Authorization Number (if provided by Dell support technician):
Operating system and version:
Peripherals:
Expansion cards:
Are you connected to a network? Yes No
Network, version, and network card:
Programs and versions:
See your operating system documentation to determine the contents of the system's start-up files. If possible, print each file. Otherwise, record the contents of each file before calling Dell.
Error message, beep code, or diagnostic code:
Description of problem and troubleshooting procedures you performed:

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Contacting Dell

To contact Dell electronically, you can access the following websites:

- **www.dell.com**

- **www.support.dell.com** (support)

For specific web addresses for your country, find the appropriate country section in the table below.

📝 NOTE: Toll-free numbers are for use within the country for which they are listed.

📝 NOTE: In certain countries, support specific to Dell™ XPS™ computers is available at a separate telephone number listed for participating countries. If you do not see a telephone number listed that is specific for XPS computers, you may contact Dell through the support number listed and your call will be routed appropriately.

When you need to contact Dell, use the electronic addresses, telephone numbers, and codes provided in the following table. If you need assistance in determining which codes to use, contact a local or an international operator.

📝 NOTE: The contact information provided was deemed correct at the time that this document went to print and is subject to change.

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Anguilla	General Support	toll-free: 800-335-0031
Antigua and Barbuda	General Support	1-800-805-5924
Argentina (Buenos Aires) International Access Code: **00** Country Code: **54** City Code: **11**	Website: **dell.com.ar**	
	E-mail: us_latin_services@dell.com	
	E-mail for desktop and portable computers: la-techsupport@dell.com	
	E-mail for servers and EMC® storage products: la_enterprise@dell.com	
	Customer Care	toll-free: 0-800-444-0730
	Technical Support	toll-free: 0-800-444-0733
	Technical Support Services	toll-free: 0-800-444-0724
	Sales	0-810-444-3355
Aruba	General Support	toll-free: 800-1578
Australia (Sydney) International Access Code: **0011**	Website: support.ap.dell.com	
	E-mail: support.ap.dell.com/contactus	

Country Code: **61** City Code: **2**	General Support	13DELL-133355
Austria (Vienna) International Access Code: **900** Country Code: **43** City Code: **1**	Website: **support.euro.dell.com**	
	E-mail: tech_support_central_europe@dell.com	
	Home/Small Business Sales	0820 240 530 00
	Home/Small Business Fax	0820 240 530 49
	Home/Small Business Customer Care	0820 240 530 14
	Preferred Accounts/Corporate Customer Care	0820 240 530 16
	Support for XPS	0820 240 530 81
	Home/Small Business Support for all other Dell computers	0820 240 530 17
	Preferred Accounts/Corporate Support	0660 8779
	Switchboard	0820 240 530 00
Bahamas	General Support	toll-free: 1-866-278-6818
Barbados	General Support	1-800-534-3066
Belgium (Brussels) International Access Code: **00** Country Code: **32** City Code: **2**	Website: **support.euro.dell.com**	
	Tech Support for XPS	02 481 92 96
	Tech Support for all other Dell computers	02 481 92 88
	Tech Support Fax	02 481 92 95
	Customer Care	02 713 15 65
	Corporate Sales	02 481 91 00
	Fax	02 481 92 99
	Switchboard	02 481 91 00
Bermuda	General Support	1-800-342-0671
Bolivia	General Support	toll-free: 800-10-0238
Brazil International Access Code: **00** Country Code: **55** City Code: **51**	Website: **dell.com/br**	
	Customer Support, Tech Support	0800 90 3355
	Technical Support Fax	51 481 5470
	Customer Care Fax	51 481 5480
	Sales	0800 90 3390
British Virgin Islands	General Support	toll-free: 1-866-278-6820
Brunei Country Code: **673**	Technical Support (Penang, Malaysia)	604 633 4966
	Customer Care (Penang, Malaysia)	604 633 4888
	Transaction Sales (Penang, Malaysia)	604 633 4955
	Online Order Status: **dell.ca/ostatus**	

Canada (North York, Ontario) International Access Code: **011**	AutoTech (automated Hardware and Warranty Support)	toll-free: 1-800-247-9362
	Customer Service (Home Sales/Small Business)	toll-free: 1-800-847-4096
	Customer Service (med./large business, government)	toll-free: 1-800-326-9463
	Customer Service (printers, projectors, televisions, handhelds, digital jukebox, and wireless)	toll-free: 1-800-847-4096
	Hardware Warranty Support (Home Sales/Small Business)	toll-free: 1-800-906-3355
	Hardware Warranty Support (med./large bus., government)	toll-free: 1-800-387-5757
	Hardware Warranty Support (printers, projectors, televisions, handhelds, digital jukebox, and wireless)	1-877-335-5767
	Sales (Home Sales/Small Business)	toll-free: 1-800-387-5752
	Sales (med./large bus., government)	toll-free: 1-800-387-5755
	Spare Parts Sales & Extended Service Sales	1 866 440 3355
Cayman Islands	General Support	1-800-805-7541
Chile (Santiago) Country Code: **56** City Code: **2**	Sales and Customer Support	toll-free: 1230-020-4823
China (Xiamen) Country Code: **86** City Code: **592**	Technical Support website: **support.dell.com.cn**	
	Technical Support E-mail: cn_support@dell.com	
	Customer Care E-mail: customer_cn@dell.com	
	Technical Support Fax	592 818 1350
	Technical Support (Dell™ Dimension™ and Inspiron)	toll-free: 800 858 2968
	Technical Support (OptiPlex™, Latitude™, and Dell Precision™)	toll-free: 800 858 0950
	Technical Support (servers and storage)	toll-free: 800 858 0960
	Technical Support (projectors, PDAs, switches, routers, and so on)	toll-free: 800 858 2920
	Technical Support (printers)	toll-free: 800 858 2311
	Customer Care	toll-free: 800 858 2060
	Customer Care Fax	592 818 1308
	Home and Small Business	toll-free: 800 858 2222
	Preferred Accounts Division	toll-free: 800 858 2557
	Large Corporate Accounts GCP	toll-free: 800 858 2055
	Large Corporate Accounts Key Accounts	toll-free: 800 858 2628
	Large Corporate Accounts North	toll-free: 800 858 2999
	Large Corporate Accounts North Government and Education	toll-free: 800 858 2955

	Large Corporate Accounts East	toll-free: 800 858 2020
	Large Corporate Accounts East Government and Education	toll-free: 800 858 2669
	Large Corporate Accounts Queue Team	toll-free: 800 858 2572
	Large Corporate Accounts South	toll-free: 800 858 2355
	Large Corporate Accounts West	toll-free: 800 858 2811
	Large Corporate Accounts Spare Parts	toll-free: 800 858 2621
Colombia	General Support	980-9-15-3978
Costa Rica	General Support	0800-012-0435
Czech Republic (Prague) International Access Code: **00** Country Code: **420**	Website: **support.euro.dell.com**	
	E-mail: czech_dell@dell.com	
	Technical Support	22537 2727
	Customer Care	22537 2707
	Fax	22537 2714
	Technical Fax	22537 2728
	Switchboard	22537 2711
Denmark (Copenhagen) International Access Code: **00** Country Code: **45**	Website: **support.euro.dell.com**	
	Technical Support for XPS	7010 0074
	Technical Support for all other Dell computers	7023 0182
	Customer Care (Relational)	7023 0184
	Home/Small Business Customer Care	3287 5505
	Switchboard (Relational)	3287 1200
	Switchboard Fax (Relational)	3287 1201
	Switchboard (Home/Small Business)	3287 5000
	Switchboard Fax (Home/Small Business)	3287 5001
Dominica	General Support	toll-free: 1-866-278-6821
Dominican Republic	General Support	1-800-148-0530
Ecuador	General Support	toll-free: 999-119
El Salvador	General Support	01-899-753-0777
Finland (Helsinki) International Access Code: **990** Country Code: **358** City Code: **9**	Website: **support.euro.dell.com**	
	E-mail: fi_support@dell.com	
	Technical Support	0207 533 555
	Customer Care	0207 533 538
	Switchboard	0207 533 533
	Sales under 500 employees	0207 533 540
	Fax	0207 533 530
	Sales over 500 employees	0207 533 533

	Fax	0207 533 530
France (Paris) (Montpellier) International Access Code: **00** Country Code: **33** City Codes: **(1) (4)**	Website: **support.euro.dell.com**	
	Home and Small Business	
	Technical Support for XPS	0825 387 129
	Technical Support for all other Dell computers	0825 387 270
	Customer Care	0825 823 833
	Switchboard	0825 004 700
	Switchboard (calls from outside of France)	04 99 75 40 00
	Sales	0825 004 700
	Fax	0825 004 701
	Fax (calls from outside of France)	04 99 75 40 01
	Corporate	
	Technical Support	0825 004 719
	Customer Care	0825 338 339
	Switchboard	01 55 94 71 00
	Sales	01 55 94 71 00
	Fax	01 55 94 71 01
Germany (Langen) International Access Code: **00** Country Code: **49** City Code: **6103**	Website: **support.euro.dell.com**	
	E-mail: tech_support_central_europe@dell.com	
	Technical Support for XPS	069 9792 7222
	Technical Support for all other Dell computers	069 9792-7200
	Home/Small Business Customer Care	0180-5-224400
	Global Segment Customer Care	06103 766-9570
	Preferred Accounts Customer Care	06103 766-9420
	Large Accounts Customer Care	06103 766-9560
	Public Accounts Customer Care	06103 766-9555
	Switchboard	06103 766-7000
Greece International Access Code: **00** Country Code: **30**	Website: **support.euro.dell.com**	
	Technical Support	00800-44 14 95 18
	Gold Service Technical Support	00800-44 14 00 83
	Switchboard	2108129810
	Gold Service Switchboard	2108129811
	Sales	2108129800
	Fax	2108129812
Grenada	General Support	toll-free: 1-866-540-3355
Guatemala	General Support	1-800-999-0136
Guyana	General Support	toll-free: 1-877-270-4609

Hong Kong International Access Code: **001** Country Code: **852**	Website: support.ap.dell.com	
	Technical Support E-mail: HK_support@Dell.com	
	Technical Support (Dimension and Inspiron)	2969 3188
	Technical Support (OptiPlex, Latitude, and Dell Precision)	2969 3191
	Technical Support (PowerApp™, PowerEdge™, PowerConnect™, and PowerVault™)	2969 3196
	Customer Care	3416 0910
	Large Corporate Accounts	3416 0907
	Global Customer Programs	3416 0908
	Medium Business Division	3416 0912
	Home and Small Business Division	2969 3105
India	E-mail: india_support_desktop@dell.com india_support_notebook@dell.com india_support_Server@dell.com	
	Technical Support	1600338045 and 1600448046
	Sales (Large Corporate Accounts)	1600 33 8044
	Sales (Home and Small Business)	1600 33 8046
Ireland (Cherrywood) International Access Code: **00** Country Code: **353** City Code: **1**	Website: **support.euro.dell.com**	
	E-mail: dell_direct_support@dell.com	
	Sales	
	Ireland Sales	01 204 4444
	Dell Outlet	1850 200 778
	Online Ordering HelpDesk	1850 200 778
	Customer Care	
	Home User Customer Care	01 204 4014
	Small Business Customer Care	01 204 4014
	Corporate Customer Care	1850 200 982
	Technical Support	
	Technical Support for XPS	1850 200 722
	Technical Support for all other Dell computers	1850 543 543
	At-Home-Service — Technical Support Queries	1850 200 889
	General	
	Fax/Sales Fax	01 204 0103
	Switchboard	01 204 4444
	U.K. Technical Support (dial within U.K. only)	0870 353 0800
	U.K. Customer Care (dial within U.K. only)	0870 353 0202

	Corporate Customer Care (dial within U.K. only)	0870 353 0240
	U.K. Sales (dial within U.K. only)	0870 353 4000
Italy (Milan) International Access Code: **00** Country Code: **39** City Code: **02**	Website: **support.euro.dell.com**	
	Home and Small Business	
	Technical Support	02 577 826 90
	Customer Care	02 696 821 14
	Fax	02 696 821 13
	Switchboard	02 696 821 12
	Corporate	
	Technical Support	02 577 826 90
	Customer Care	02 577 825 55
	Fax	02 575 035 30
	Switchboard	02 577 821
Jamaica	General Support (dial from within Jamaica only)	1-800-682-3639
Japan (Kawasaki) International Access Code: **001** Country Code: **81** City Code: **44**	Website: **support.jp.dell.com**	
	Technical Support (servers)	toll-free: 0120-198-498
	Technical Support outside of Japan (servers)	81-44-556-4162
	Technical Support (Dimension and Inspiron)	toll-free: 0120-198-226
	Technical Support outside of Japan (Dimension and Inspiron)	81-44-520-1435
	Technical Support (Dell Precision, OptiPlex, and Latitude)	toll-free:0120-198-433
	Technical Support outside of Japan (Dell Precision, OptiPlex, and Latitude)	81-44-556-3894
	Technical Support (PDAs, projectors, printers, routers)	toll-free: 0120-981-690
	Technical Support outside of Japan (PDAs, projectors, printers, routers)	81-44-556-3468
	Faxbox Service	044-556-3490
	24-Hour Automated Order Status Service	044-556-3801
	Customer Care	044-556-4240
	Business Sales Division (up to 400 employees)	044-556-1465
	Preferred Accounts Division Sales (over 400 employees)	044-556-3433
	Public Sales (government agencies, educational institutions, and medical institutions)	044-556-5963
	Global Segment Japan	044-556-3469
	Individual User	044-556-1760
	Switchboard	044-556-4300
Korea (Seoul)	E-mail: krsupport@dell.com	

International Access Code: 001 Country Code: **82** City Code: **2**	Support	toll-free: 080-200-3800
	Support (Dimension, PDA, Electronics and Accessories)	toll-free: 080-200-3801
	Sales	toll-free: 080-200-3600
	Fax	2194-6202
	Switchboard	2194-6000
Latin America	Customer Technical Support (Austin, Texas, U.S.A.)	512 728-4093
	Customer Service (Austin, Texas, U.S.A.)	512 728-3619
	Fax (Technical Support and Customer Service) (Austin, Texas, U.S.A.)	512 728-3883
	Sales (Austin, Texas, U.S.A.)	512 728-4397
	SalesFax (Austin, Texas, U.S.A.)	512 728-4600 or 512 728-3772
Luxembourg International Access Code: **00** Country Code: **352**	Website: **support.euro.dell.com**	
	Support	342 08 08 075
	Home/Small Business Sales	+32 (0)2 713 15 96
	Corporate Sales	26 25 77 81
	Customer Care	+32 (0)2 481 91 19
	Fax	26 25 77 82
Macao Country Code: **853**	Technical Support	toll-free: 0800 105
	Customer Service (Xiamen, China)	34 160 910
	Transaction Sales (Xiamen, China)	29 693 115
Malaysia (Penang) International Access Code: **00** Country Code: **60** City Code: **4**	Website: **support.ap.dell.com**	
	Technical Support (Dell Precision, OptiPlex, and Latitude)	toll-free: 1 800 880 193
	Technical Support (Dimension, Inspiron, and Electronics and Accessories)	toll-free: 1 800 881 306
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 1800 881 386
	Customer Care	toll-free: 1800 881 306 (option 6)
	Transaction Sales	toll-free: 1 800 888 202
	Corporate Sales	toll-free: 1 800 888 213
Mexico International Access Code: **00** Country Code: **52**	Customer Technical Support	001-877-384-8979 or 001-877-269-3383
	Sales	50-81-8800 or 01-800-888-3355
	Customer Service	001-877-384-8979

		or 001-877-269-3383
	Main	50-81-8800
		or 01-800-888-3355
Montserrat	General Support	toll-free: 1-866-278-6822
Netherlands Antilles	General Support	001-800-882-1519
Netherlands (Amsterdam) International Access Code: **00** Country Code: **31** City Code: **20**	Website: **support.euro.dell.com**	
	Technical Support for XPS	020 674 45 94
	Technical Support for all other Dell computers	020 674 45 00
	Technical Support Fax	020 674 47 66
	Home/Small Business Customer Care	020 674 42 00
	Relational Customer Care	020 674 4325
	Home/Small Business Sales	020 674 55 00
	Relational Sales	020 674 50 00
	Home/Small Business Sales Fax	020 674 47 75
	Relational Sales Fax	020 674 47 50
	Switchboard	020 674 50 00
	Switchboard Fax	020 674 47 50
New Zealand International Access Code: **00** Country Code: **64**	Website: **support.ap.dell.com**	
	E-mail: support.ap.dell.com/contactus	
	General Support	0800 441 567
Nicaragua	General Support	001-800-220-1006
Norway (Lysaker) International Access Code: **00** Country Code: **47**	Website: **support.euro.dell.com**	
	Technical Support for XPS	815 35 043
	Technical Support for all other Dell products	671 16882
	Relational Customer Care	671 17575
	Home/Small Business Customer Care	23162298
	Switchboard	671 16800
	Fax Switchboard	671 16865
Panama	General Support	001-800-507-0962
Peru	General Support	0800-50-669
Poland (Warsaw) International Access Code: **011** Country Code: **48**	Website: **support.euro.dell.com**	
	E-mail: pl_support_tech@dell.com	
	Customer Service Phone	57 95 700
	Customer Care	57 95 999
	Sales	57 95 999
	Customer Service Fax	57 95 806

City Code: **22**	Reception Desk Fax	57 95 998
	Switchboard	57 95 999
Portugal International Access Code: **00** Country Code: **351**	Website: **support.euro.dell.com**	
	Technical Support	707200149
	Customer Care	800 300 413
	Sales	800 300 410 or 800 300 411 or 800 300 412 or 21 422 07 10
	Fax	21 424 01 12
Puerto Rico	General Support	1-800-805-7545
St. Kitts and Nevis	General Support	toll-free: 1-877-441-4731
St. Lucia	General Support	1-800-882-1521
St. Vincent and the Grenadines	General Support	toll-free: 1-877-270-4609
Singapore (Singapore) International Access Code: **005** Country Code: **65**	NOTE: The phone numbers in this section should be called from within Singapore or Malaysia only.	
	Website: **support.euro.dell.com**	
	Technical Support (Dimension, Inspiron, and Electronics and Accessories)	toll-free: 1 800 394 7430
	Technical Support (OptiPlex, Latitude, and Dell Precision)	toll-free: 1 800 394 7488
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 1 800 394 7478
	Customer Care	toll-free: 1 800 394 7430 (option 6)
	Transaction Sales	toll-free: 1 800 394 7412
	Corporate Sales	toll-free: 1 800 394 7419
Slovakia (Prague) International Access Code: **00** Country Code: **421**	Website: **support.euro.dell.com**	
	E-mail: czech_dell@dell.com	
	Technical Support	02 5441 5727
	Customer Care	420 22537 2707
	Fax	02 5441 8328
	Tech Fax	02 5441 8328
	Switchboard (Sales)	02 5441 7585
South Africa (Johannesburg) International Access Code: **09/091**	Website: **support.euro.dell.com**	
	E-mail: dell_za_support@dell.com	
	Gold Queue	011 709 7713
	Technical Support	011 709 7710
	Customer Care	011 709 7707

Country Code: **27** City Code: **11**	Sales	011 709 7700
	Fax	011 706 0495
	Switchboard	011 709 7700
Southeast Asian and Pacific Countries	Technical Support, Customer Service, and Sales (Penang, Malaysia)	604 633 4810
Spain (Madrid) International Access Code: **00** Country Code: **34** City Code: **91**	Website: **support.euro.dell.com**	
	Home and Small Business	
	Technical Support	902 100 130
	Customer Care	902 118 540
	Sales	902 118 541
	Switchboard	902 118 541
	Fax	902 118 539
	Corporate	
	Technical Support	902 100 130
	Customer Care	902 115 236
	Switchboard	91 722 92 00
	Fax	91 722 95 83
Sweden (Upplands Vasby) International Access Code: **00** Country Code: **46** City Code: **8**	Website: **support.euro.dell.com**	
	Technical Support for XPS	0771 340 340
	Technical Support for all other Dell products	08 590 05 199
	Relational Customer Care	08 590 05 642
	Home/Small Business Customer Care	08 587 70 527
	Employee Purchase Program (EPP) Support	020 140 14 44
	Technical Support Fax	08 590 05 594
	Sales	08 590 05 185
Switzerland (Geneva) International Access Code: **00** Country Code: **41** City Code: **22**	Website: **support.euro.dell.com**	
	E-mail: Tech_support_central_Europe@dell.com	
	Technical Support for XPS	0848 33 88 57
	Technical Support (Home and Small Business) for all other Dell products	0844 811 411
	Technical Support (Corporate)	0844 822 844
	Customer Care (Home and Small Business)	0848 802 202
	Customer Care (Corporate)	0848 821 721
	Fax	022 799 01 90
	Switchboard	022 799 01 01
Taiwan	Website: **support.ap.dell.com**	
	E-mail: ap_support@dell.com	
	Technical Support (OptiPlex, Latitude, Inspiron,	

International Access Code: **002** Country Code: **886**	Dimension, and Electronics and Accessories)	toll-free: 00801 86 1011
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 00801 60 1256
	Customer Care	toll-free: 00801 60 1250 (option 5)
	Transaction Sales	toll-free: 00801 65 1228
	Corporate Sales	toll-free: 00801 651 227
Thailand International Access Code: **001** Country Code: **66**	Website: **support.ap.dell.com**	
	Technical Support (OptiPlex, Latitude, and Dell Precision)	toll-free: 1800 0060 07
	Technical Support (PowerApp, PowerEdge, PowerConnect, and PowerVault)	toll-free: 1800 0600 09
	Customer Care	toll-free: 1800 006 007 (option 7)
	Corporate Sales	toll-free: 1800 006 009
	Transaction Sales	toll-free: 1800 006 006
Trinidad/Tobago	General Support	1-800-805-8035
Turks and Caicos Islands	General Support	toll-free: 1-866-540-3355
U.K. (Bracknell) International Access Code: **00** Country Code: **44** City Code: **1344**	Website: **support.euro.dell.com**	
	E-mail: dell_direct_support@dell.com	
	Customer Care website: **support.euro.dell.com/uk/en/ECare/form/home.asp**	
	Sales	
	Home and Small Business Sales	0870 907 4000
	Corporate/Public Sector Sales	01344 860 456
	Customer Care	
	Home and Small Business Customer Care	0870 906 0010
	Corporate Customer Care	01344 373 185
	Preferred Accounts (500–5000 employees) Customer Care	0870 906 0010
	Global Accounts Customer Care	01344 373 186
	Central Government Customer Care	01344 373 193
	Local Government & Education Customer Care	01344 373 199
	Health Customer Care	01344 373 194
	Technical Support	
	Technical Support for XPS	0870 366 4180
	Technical Support (Corporate/Preferred Accounts/PAD [1000+ employees])	0870 908 0500
	General	

	Technical Support for all other products	0870 908 0800
	Home and Small Business Fax	0870 907 4006
Uruguay	General Support	toll-free: 000-413-598-2521
U.S.A. (Austin, Texas) International Access Code: **011** Country Code: **1**	Automated Order-Status Service	toll-free: 1-800-433-9014
	AutoTech (portable and desktop computers)	toll-free: 1-800-247-9362
	Hardware and Warranty Support (Dell TV, Printers, and Projectors) for Relationship customers	toll-free: 1-877-459-7298
	Americas Consumer XPS Support	toll-free: 1-800-232-8544
	Consumer (Home and Home Office) Support for all other Dell products	toll-free: 1-800-624-9896
	Customer Service	toll-free: 1-800-624-9897
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-695-8133
	Financial Services website: **www.dellfinancialservices.com**	
	Financial Services (lease/loans)	toll-free: 1-877-577-3355
	Financial Services (Dell Preferred Accounts [DPA])	toll-free: 1-800-283-2210
	Business	
	Customer Service and Support	toll-free: 1-800-456-3355
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-695-8133
	Support for printers, projectors, PDAs, and MP3 players	toll-free: 1-877-459-7298
	Public (government, education, and healthcare)	
	Customer Service and Support	toll-free: 1-800-456-3355
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-695-8133
	Dell Sales	toll-free: 1-800-289-3355 or toll-free: 1-800-879-3355
	Dell Outlet Store (Dell refurbished computers)	toll-free: 1-888-798-7561
	Software and Peripherals Sales	toll-free: 1-800-671-3355
	Spare Parts Sales	toll-free: 1-800-357-3355
	Extended Service and Warranty Sales	toll-free: 1-800-247-4618
	Fax	toll-free: 1-800-727-8320
	Dell Services for the Deaf, Hard-of-Hearing, or Speech-Impaired	toll-free: 1-877-DELLTTY (1-877-335-5889)
U.S. Virgin Islands	General Support	1-877-673-3355
Venezuela	General Support	8001-3605

Specifications

Tape Drive Capacity and Performance

Drive Model	Tape Format	Capacity[*]	Sustained Transfer Rate[*]	Interface Type
PowerVault LTO-2-024	Ultrium Gen. 2 Ultrium Gen. 1	200/400 GB 100/200 GB	24/48 MB/sec 16/32 MB/sec	Ultra160 Ultra160

[*] Capacity and transfer rate given in native/compressed (assuming 2:1 compression)

Media Specifications and Compatibility

Drive Model	Media Name	Tape Length	Capacity (Native/compressed)
PowerVault LTO-2-024	LTO Ultrium Generation 2 (Read/Write compatible)	**609 m**	200 GB/ 400 GB
	LTO Ultrium Generation 1 (Read/Write compatible)	**609 m**	100 GB/ 200 GB

Mechanical Specifications

Standard drive mounting, internal drive:

Fits in 5.25-inch half-height standard drive bay. Standard mounting holes for a half-height drive.

	Height/width/depth	Weight
Internal drive:	41.3/146.0/214 mm (1.63/5.75/8.43 inch)	1.4 kg (3.2 lbs)
External drive:	65/205/259 mm (2.56/8.1/10.2 inch)	3.0 kg (6.6 lbs)

Power Specifications

Internal drive:	Operating: 18 W
	Sleep mode with cartridge inserted: 9 W
External drive:	AC input, 50-60 Hz: 100 VAC / 0.6 A or 240 VAC / 0.3 A

Environmental Specifications

	Temperature (^{0}C)	Rel. Humidity (%)
Operating	+10 to +40	20 to 80
Storage	-30 to +60	5 to 90
Transport	-40 to +60	5 to 95

Glossary

Active Termination	Enhanced SCSI termination that provides better stability and noise immunity of the electrical signals on the SCSI bus lines.
ALDC	Adaptive Lossless Data Compression. A hardware data compression method.
ASPI	Advanced SCSI Programming Interface. Standard SCSI software that acts as a liaison between host adapters and SCSI device drivers. ASPI enables host adapters and device drivers to share a single SCSI hardware interface.
Auto sensing	PowerVault LTO-2-024 feature that allows detection of the best transfer rate to use for optimizing performance on the SCSI bus.
EEPROM	Electrically Erasable Programmable Read Only Memory. An integrated circuit typically used to store configuration information.
GUI	Graphical User Interface. Software which interacts with the user.
ID	See SCSI ID.
LVD	Low Voltage Differential. A SCSI interface that provides better stability and noise immunity of the electrical signals on the SCSI bus. LVD also allows longer SCSI bus length and improved data rates.
RWW	Read While Write. All Tandberg tape drives automatically and internally read the data just being written to the tape to avoid writing to bad block.
SCSI	Small Computer Signaling Interface. The PowerVault LTO-2-024 utilizes the SCSI Ultra160 interface which allows for a transfer rate of up to 160 MB/sec on the bus.
SCSI ID	A unique identifier assigned to SCSI devices that enables them to communicate with a computer when they are attached to a host adapter via the SCSI bus. Each SCSI host adapter board has eight available SCSI IDs with numbers 0 through 7 (or 0 through 15 for Wide SCSI adapters). Usually the host adapter itself is assigned SCSI ID 7.
SLDC™	Streaming Lossless Data Compression. The hardware data compression method specified as the standard for the two Ultrum tape formats and thus used with the PowerVault LTO-2-024 tape drives.
HBA	Host Board Adapter. The SCSI interface board located in the server/PC

Operation

Front LED Indicators

Figure 1: Status indicators (LEDs)
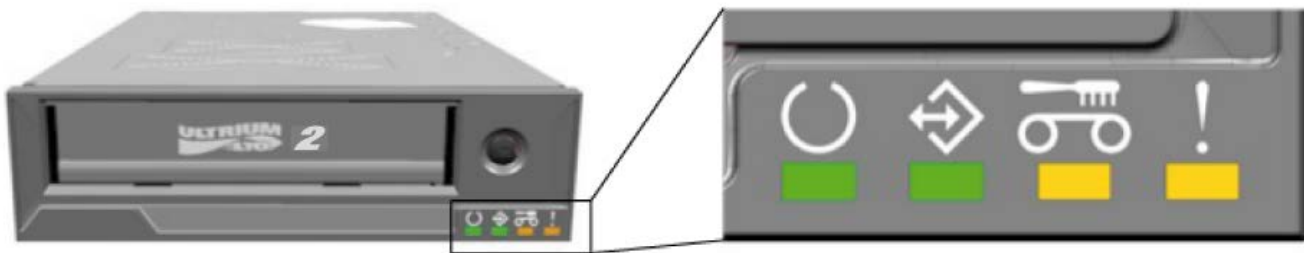
Table 1: Front LED behaviour during normal operation

Drive State Normal operation	READY LED (Green)	ACTIVITY LED (Green)	CLEAN LED (Amber) [2]	FAULT LED (Amber)
LED-test. [1] The LEDs are turned ON briefly.	ON	ON	ON	ON
Power-On Self-Test in progress	Flashing	OFF	OFF	OFF
Cartridge not loaded	ON	OFF	OFF	OFF
Cartridge not loaded, Drive needs cleaning	ON	OFF	ON	OFF
Cartridge loaded, no activity	ON	OFF	OFF	OFF
Cartridge loaded, no activity Drive needs cleaning	ON	OFF	ON	OFF
Cartridge loaded, activity	ON	Flashing	OFF	OFF
Cartridge loaded, activity Drive needs cleaning	ON	Flashing	ON	OFF
Cleaning cartridge loaded, Activity	OFF	Flashing	ON	OFF
Cartridge loading or unloading	ON	Flashing	OFF	OFF
Cartridge loading or unloading Drive needs cleaning	ON	Flashing	ON	OFF

[1] LED's are turned on during boot process briefly, then the Ready and Activity LEDs operate till the POST is complete.

[2] A solid amber Clean LED indicates that the drive needs cleaning. In most cases it will continue to operate normally if cleaned within a short time.

Table 2: Front LED behaviour during firmware update operations

Drive State FW updates	READY LED (Green)	ACTIVITY LED (Green)	CLEAN LED (Amber)	FAULT LED (Amber)
Firmware download [3] in progress	Flashing	OFF	OFF	OFF
Firmware download [3] in progress, drive needs cleaning	Flashing	OFF	ON	OFF
Frimware update [4] in progress	Flashing	Flashing	OFF	OFF
Firmware update [4] in progress, drive needs cleaning	Flashing	Flashing	ON	OFF

[3] Firmware download refers to the transfer of firmware from the host to the drive

[4] Firmware update refers to the drive incorporating the new firmware (storing in flash memeory)

Table 3: Front LED behavior during error conditions

Drive State Error conditions	READY LED (Green)	ACTIVITY LED (Green)	CLEAN LED (Amber)	FAULT LED (Amber)
Cleaning cartridge loaded, Cleaning failed	OFF	OFF	ON	OFF
Unrecoverable failure	OFF	OFF	OFF	Flashing
Unrecoverable failure Drive needs cleaning	OFF	OFF	ON	Flashing
Firmware download or update failure	Flashing	Flashing	OFF	Flashing
Firmware download or update failure drive needs cleaning	Flashing	Flashing	ON	Flashing
Maximum operating temperature exceeded [5]	ON	OFF	OFF	ON
Maximum operating temperature exceeded, drive needs cleaning [5]	ON	OFF	ON	ON
Media Error (wrong or harmed media)	ON	Flashing	OFF	Flashing
Media Error (wrong or harmed media) Drive needs cleaning	ON	Flashing	ON	Flashing

[5] The fault LED must be solid ON to indicate an over temperature condition. If a tape is loaded, it will be ejected. This LED will remain on until the drive temperature drops below a secondary temprature limit.

⚠ **CAUTION: During firmware update, the power to the drive must not be switched off. Switching it off will cause the drive to become inoperative.**

Ready LED

The Ready LED indicates that the drive is connected to the power supply. It may be turned off during an error condition. However, at least one LED will be lit when the drive is connected to power.

Activity LED

When the Activity LED is ON and the Fault LED is off, the drive is performing an operation. The Eject button should not be pressed as the operation will be aborted, unless the application has disabled the Eject function during operation. If aborted during a write operation, the written data may be incorrectly terminated resulting in errors if an attempt is made to restore the data.

Clean LED

When the Clean LED is steady on, the drive is indicating that it needs cleaning by a cleaning cartridge. The Clean LED will be turned on by:

- 100 hours of tape operation since last cleaning.
- Media Management determined a suspect cleaning condition.
- A fault situation where cleaning should be done to recover.

When the Clean LED is on, a cleaning cartridge should be run before any other tape activity is attempted.

Once lit, the Clean LED can only be turned off by running a cleaning cartridge. A power cycle will not clear the Clean LED.

Fault LED

If the Fault LED is lit, see Troubleshooting.

Tape Cartridge Operation

Use only certified quality cartridges for the PowerVault LTO-2-024 tape drives. Do not use worn or audibly noisy cartridges. Cartridges which frequently require rewriting of large numbers of data-blocks per track should also be discarded.

Loading a Data Cartridge

The cartridge must be inserted with the label facing up and the tape dust cover towards the LEDs as shown below. The drive has a semi-soft loading mechanism: Slide the cartridge slowly into the drive until it stops firmly, then let go. The cartridge will then move back a very short distance. The drive, once it has detected the cartridge, will lock the cartridge and move it down into the drive mechanism. The tape threading will then take place and the motor sound may be heard.

Once a cartridge is detected by the Drive, the Activity LED will start flashing, and continue flashing until the tape is fully threaded into the drive. With a brand-new tape, the drive will initialize the tape, spending some extra time until the Activity LED is turned off.

To prevent damage to the drive or the cartridge:

- DO NOT use excessive force
- Ensure that you insert the cartridge in the correct orientation
- Do not drop the drive or the cartridge (handle with care)

Figure 2: Cartridge insertion

Ejecting a Data Cartridge

The cartridge can be ejected either by pressing the **Eject** button located on the drive's front panel, or by an **Unload SCSI** command. The drive automatically rewinds and ejects the cartridge.

Notice: For the integrity of your backups and restores, do not press the **Eject** button when the Activity LED is flashing.

> 📝 **Note:** Some backup applications issue a command to the drive that prevents the Eject button from ejecting the tape. If the tape does not eject, try using the commands in your backup software.

Figure 3: Location of the eject button
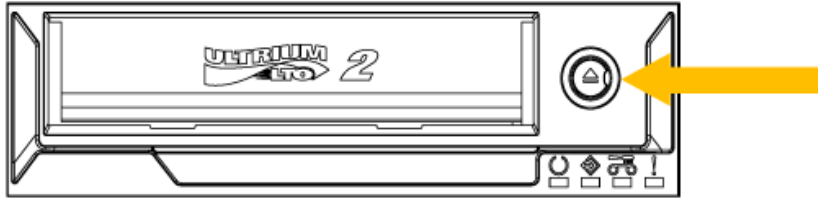
Write Protecting the Cartridge

The LTO cartridge can be write-protected by moving the tab as indicated in the figure below.

Figure 4: LTO cartridge write protect switch

A = Tape Window. The window is spring loaded and closed when the cartridge is not inserted.

B = Write Protect Switch. The picture shows the switch in the non-protected position. When it is write protected, the switch is to the right and the area is red.

Handling and Storing LTO Cartridges

To improve data reliability and cartridge lifetime, it is important to handle and store the cartridges properly.

- Do not drop the cartridges.
- Ensure that the cartridges are stored in a clean environment away from dirt, dust, or moisture.
- It is recommended to store cartridges in their protective case.
- Do not expose the cartridge to direct sunlight or excessive heat sources.
- Do not touch the tape media inside a cartridge.
- Prior to use, the LTO cartridge should be adapted to the operating environment for a time at least equal to the period it has been out of the operating environment outside and above 10°C – 35°C (up to a maximum of 24 hours). Recommended operating temperature is 25°C or below (see tape drive specifications).
- Replace worn or excessively noisy LTO cartridges.
- Store the LTO cartridge in a cool and dry environment. Avoid high temperatures. Recommended maximum temperature is 25°C/77°F and 50 % RH humidity.
- Do not store the LTO cartridge near devices such as computer monitors, TV sets, or loudspeakers with strong magnetic fields (not exceeding 4000/A/m).

Cleaning the Tape Drive

A standard LTO type cleaning cartridge is included with your tape drive. Before use, the cleaning cartridge should be

conditioned to the operating environment for a time at least equal to the period it has been outside the operating environment and outside or above 10°C – 35°C (up to a maximum of 24 hours). Recommended operating temperature is 25°C/77°F or below (see tape drive specifications).

Recommended Cleaning Interval

If the Clean LED is **On,** a head cleaning is recommended (the drive is still fully operational with this LED steady **On**). The LED is triggered after 100 hours of tape use, if the Media Management Algorithm has detected severely degraded write performance, or if a hard read/write error has occurred. The LED is not turned off by a power cycle and is only reset when cleaning has completed successfully.

Cleaning Procedure

Figure 5: Activity and Clean LEDs

A= Activity LED

B= Clean LED

1. Load the cleaning cartridge into the PowerVault LTO-2-024 tape drive.

2. The cleaning process will begin automatically. This is indicated by the front LEDs on the product as seen in figure 5.

3. The Clean LED will be OFF if the cleaning was successful ((up to 3 minutes).

4. The cartridge may be ejected by pushing the Eject button, when cleaning is complete.

Note: The cleaning cartridge can only be used 50 times. If an expired cleaning cartridge is inserted the Clean LED will remain on and the cleaning cartridge will not be ejected. Press the **Eject** button to eject the cleaning cartridge.

Dell™ PowerVault™ 110T DLT VS 80 Drive